1919

Arsenic

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ARSENIC

By Allison Butts

The demand for arsenic in 1918 continued exceptionally strong.

The domestic production in 1918 was 11,323 short tons of white arsenic. This quantity is 85 per cent. greater than that produced in 1917. The value of the output in 1918 at the price fixed was $2,112,550, but the actual value was probably slightly greater, as the price was not fixed until February. There was also produced 3487 lb. of metallic arsenic, valued at $2610.

The price of white arsenic was fixed by the Food Administration in February at 9 cts. per lb., with a small advance allowed to local dealers. Just previous to this regulation the price had been 16 to 18 cts. per lb., while early in 1916 before the scarcity developed due to the war the price was 4 cts.

The United States production is by 4 companies, operating 7 plants. The two principal producers are the Anaconda Copper Mining Co. at Anaconda, Mont., and the American Smelting & Refining Co. at Denver, Colo. The latter has an output of about 120 tons per month and the former 300 tons, but the Anaconda company is constructing large additional capacity in connection with their new smoke-recovery plant. The fume, recovered in box-type Cottrell treaters, will be charged into a reverberatory furnace. The gases from the furnace will be cleaned by passing them through hot-treaters and then the arsenic fume precipitated in a cold Cottrell treater. A recovery amounting to 35 tons of white arsenic in 24 hr. is expected, which is considerably more than the present consumption in the United States and would be about equivalent to the domestic consumption of arsenic in all forms. The product of the arsenic treater runs about 92 to 95 per cent. pure and will be sold without further refining.

The demand for arsenic in 1918 was not confined to the United States; there was a scarcity in several countries, notably in England, France, and Australia, all producers themselves. Exports from the United States were negligible before the war, but last year some shipments were made to England and to South America.

STATISTICS OF ARSENIC IN THE UNITED STATES (a)
(Short Tons)

Year.	White Arsenic.							Sulphide of Arsenic.		
	Production.		Imports.		Supply.			Imports.		
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Per Ton.	Tons.	Value.	Per Ton.
1904	36	$2,185	204	$16,899	240	$19,084	$79.50	3,196	$226,481	$70.87
1905	754	35,210	616	37,342	1,370	72,552	52.96	3,222	219,198	68.03
1906	737	63,460	167	13,436	904	76,896	85.07	3,820	336,609	88.12
1907	1,751	162,000	203	21,558	1,954	184,558	94.47	4,961	553,440	88.61
1908	1,302	99,193	168	13,263	1,470	112,456	76.46	4,796	417,137	86.97
1909	1,214	52,946	444	31,235	1,638	84,181	51.39	3,592	272,493	75.86
1910	1,497	52,305	1,010	62,590	2,507	114,895	45.83	4,128	251,716	60.97
1911	3,132	73,408	1,921	116,948	5,053	190,356	37.68	2,702	159,626	59.04
1912	3,141	190,757	3,103	200,616	6,244	391,373	62.68	3,379	246,815	73.04
1913	2,513	159,236	1,519	133,597	4,032	292,833	72.62	3,344	285,537	85.38
1914	4,670	313,147	1,594	109,121	6,244	422,268	67.42	2,040	165,266	81.03
1915	5,498	302,116	1,400	113,677	6,898	415,793	60.28	1,787	154,517	86.46
1916	5,986	555,187	1,071	107,876	7,057	663,063	93.96	1,090	124,844	114.49
1917	6,151	1,118,313	1,178	264,534	7,329	1,382,847	188.50	2,726	410,341	147.80
1918	11,323	2,112,550	1,847	441,212	13,170	2,553,762	193.90	5,651	998,011	176.61

(a) Production from U. S. Geol. Surv.; imports from Dept. of Commerce.

Arsenic in Foreign Countries

Canada.[1]—The Canadian production includes arsenious oxide, refined and crude, produced in the smelting of the arsenical silver-cobalt-nickel ores of the Cobalt district, in addition to which arsenic has been recovered at Tacoma, Wash., from the arsenical gold concentrates shipped from the Hedley gold mine at Hedley, B. C. The total production in 1918 was 2483 tons of arsenious oxide and approximately 1015 tons of arsenic in concentrates, having a total valuation of $561,128. The production in 1917 was 2656 tons of arsenious oxide and 280 tons of arsenic in concentrates, having a total value of $669,431.

The exports of arsenic in 1918 were 2672 tons valued at $393,883.

Great Britain.—The production comes from Cornwall and Devon, and in spite of the high prices ruling shows a falling off for 1918, the output being only 2225 long tons, against 2574 tons in 1917. Some years ago Cornish white arsenic sold at £8 per ton, but since the war over £150 has been obtained, with a price of £100 at the middle of 1918. Later in the year the price fell off considerably. High-grade white arsenic has been imported from Australia, Japan, Greece, and the United States during the scarcity.

Greece.—This country has recently become a regular producer of arsenic, shipping a product running over 99 per cent. As_2O_3. Statistics of the output are not available, and the country is not included in the table of world's production given below.

[1] Prelim. Rept. Min. Prod. of Canada, Dept. of Mines, 1918.

Queensland.—There is a unique demand for large quantities of arsenic in Queensland, due to the discovery[1] that it is the only specific for the agricultural pest known as prickly-pear, which has been spreading at an alarming rate—said to be 1,000,000 acres annually—in Queensland. The State has several valuable deposits of arsenic ores, and the demand has become so urgent that the State has started the development of a mine at Jibbinbar and is erecting a plant for the treatment of the ore.

The Report of the Under Secretary for Mines for 1918 contains the following:

"The high price ruling for arsenic continued to stimulate its production in the Stanthorpe district, where the yield was nearly 199 tons, of the value of £2981, compared with only 32 tons in quantity and £580 in value for 1917. The bulk of the output was from the Beecroft mine, near Sundown, the remainder coming from the Orient leases at Carpenter's Gully. At the first-mentioned mine, where operations were continuous throughout the year, the ore is treated by screening and jigging, and the concentrates, which are estimated to contain 30 per cent. arsenic, are despatched to Bendigo, Victoria. The Orient leases, where the ore is of exceptionally good quality, were, owing to long-continued dry weather, under exemption during the latter part of the year. In the State arsenic mine at Jibbinbar, in the Stanthorpe Field, the main shaft has been sunk to 106 ft., poppet legs have been erected, and a winding plant has been installed. A second, or air, shaft has been put down to 125 ft., and a level driven over half the distance required to connect with the main shaft. An eastern cut (No. 1) has proved the lode channel 11 ft. thick between the walls, and in No. 2 cut 9 ft. thick. Both cuts carry a strong lode, 2 ft. thick, on the footwall. A concrete dam, with a capacity of 200,000 gal., has been constructed on Pine Creek, near the main shaft. A concentrating and furnace plant, with necessary buildings and other appurtenances, are now in course of construction."

Arsenic is found in most of the mineral-bearing fields of the State, but, so far as investigations have shown, it is principally found at Jibbinbar near Stanthorpe, and at Calliope near Gladstone. In both localities deposits are known which are of large extent and could be worked very effectively for the mining of mispickel, the natural arsenical sulphide of iron. In northern Queensland extensive lodes of arsenical ores are said to exist, but up to the present little is known officially as to their extent or value.[2]

A maximum price of £60 per ton for white arsenic within Australia has been fixed by the Government.

Rhodesia.[3]—The manufacture of white arsenic on a commercial scale was brought to a successful stage in Rhodesia early in 1918, the report of the Munitions and Resources Committee states. One unit of a plant is at present in operation, the output from which is about 14 tons per

[1] MINERAL INDUSTRY, **26,** 46 (1917).
[2] *Queens. Govt. Min. Jour.*, June, 1918.
[3] *Board of Trade Journal*, London, through *Comm. Rept.*, Nov. 16, 1918.

month. The plant is now being increased, and it is hoped to produce about 100 tons per month before the end of 1918. The product assays about 99 per cent. As_2O_3, and this grade is obtained from the ore in one operation. For the time being all the arsenic produced is shipped to the Union of South Africa for the manufacturing of arsenite of soda, but it is the intention of the syndicate now carrying on the work to turn out sheep-dips itself at a later date. Experiments in the recovery of arsenic as a by-product have been conducted. A considerable amount of attention was devoted during 1917 to prospecting for arsenical ores, and bodies of mispickel ore are now known to exist within reasonable distance of the railway line which could supply South African requirements for arsenical compounds for many years. White arsenic recovered as a by-product in gold mining would doubtless find a ready sale if the manufacture of dips and of arsenite of soda is begun, but the regular source, the committee states, would necessarily be from high-grade mispickel ores such as are known to be available in the country.

The arsenic production of Southern Rhodesia for 1918 was 114 long tons; the ore treated was 435 tons.

Union of South Africa.[1]—Within the past 6 months a promising start has been made to produce white arsenic locally. The output for the first 4 months of 1918, amounting to 6185 tons, valued at £619, came from the Stavoren Tin Mine, where massive arsenopyrite occurs, together with cassiterite, scheelite, copper pyrite, and other minerals. A plant for the production of white arsenic is also being erected at the Consort Mine in the Barberton district. Here arsenopyrite is associated with gold. As some £80,000 worth of arsenite of soda is annually consumed in the Union, the prospects of the industry appear very hopeful.

WORLD'S PRODUCTION OF ARSENIC
(In Metric Tons)

Year.	Canada. (a)	Germany. (b)	Italy. (d)	Japan. (a)	Portugal. (d)	Spain. (b)	United Kingdom. (a)	United States. (a)	France. (d)
1903	233	2,768	50	6	698	1,088	916	554	6,658
1904	66	2,829	80	4	1,370	400	992	452	3,117
1905	*Nil.*	2,535	.....	8	1,562	1,140	1,552	701	3,627
1906	*Nil.*	3,052	.....	5	1,322	1,114	1,625	754	6,534
1907	317	2,904	73	7	1,538	2,400	1,523	916	7,900
1908	649	2,822	451	20	1,655	2,004	2,007	1,301	2,381
1909	1,020	2,911	*Nil.*	8	1,420	506	2,911	914	2,141
1910	1,363	3,066	*Nil.*	12	974	444	2,187	1,203	8,045
1911	1,815	2,981	16	6	887	331	2,178	2,800	19,000
1912	1,858	4,869	*Nil.*	.....	1,006	(c)	2,228	2,855	81,880
1913	1,538	5,008	*Nil.*	.....	925	.....	1,716	2,158	70,613
1914	1,576	.....	*Nil.*	.....	960	.....	2,007	4,238	.....
1915	2,174	.....	*Nil.*	15	.....	.....	2,536	4,990	.....
1916	1,983	.....	*Nil.*	(c)	.....	.....	2,575	5,430	.....
1917	2,663	.....	*Nil.*	(c)	.....	.....	2,616	5,580	.....
1918	3,173						2,261	10,272	.....

(a) White arsenic. (b) Oxide, sulphide, etc. (c) Not yet available. (d) Ore.

[1] *So. Afr. Min. Eng. Jour.*, Feb. 22, 1919.

TECHNOLOGY AND USES

An extensive report on arsenic has been prepared for the Queensland Geological Survey.[1] In addition to the local deposits, it takes up the sources, mineralogy, geological occurrence and origin, extraction and refining, and uses of arsenic. Regarding the latter it contains the following:

"The chief industrial uses of arsenic are for glass-making and the preparation of insecticides, sprays, dips, and medicines. In the manufacture of glass arsenic, in the form of white arsenic-glass (a hyaline variety of white arsenic), is added to the molten glass, to which it imparts a clear crystal lustre and increased transparency. It is supposed that the arsenic forms arsenides with iron and manganese present in the molten glass, and these impurities settle to the bottom of the pot, leaving the glass pure and clear. Some of the arsenic added, if an excess is used, enters into the composition of the glass, and gives a pearly lustre to the product. Arsenical insecticides are extensively used as sprays in agriculture and horticulture. Paris green and lead arsenate are extensively used as insect poisons. Orpiment is used to some extent in textile dyeing. The use of green arsenical dyes and paints for wall paint and wall-paper has in latter years fallen into disuse on account of the poisonous nature of the dust from such materials. Metallic arsenic is largely used for hardening lead in shot making. It is also replacing antimony in the manufacture of chilled shot. Crude arsenic trioxide (gray arsenic) has long been utilized for killing weeds along railway tracks, and it has also been successfully used for spraying noxious weeds. Water hyacinths in Gatun Lake, Panama, were poisoned by spraying with a mixture made by boiling 25 lb. of arsenic, 25 lb. of soda, and 25 gal. of water for one hour and diluting with 425 gal. of water.

"Scattered prickly-pear plants are best destroyed by injecting the poison, for which purpose a mixture is made of 15 lb. of common salt, 10 lb. of white arsenic, and 4 lb. of caustic soda. A teaspoonful of the powder is placed in a longitudinal incision in one of the lower leaves. The same mixture can also be mixed with water and diluted to 8 gal., in which case a wineglass full of the concentrated solution is injected per plant. By diluting this same concentrated solution to 100 gal. a suitable solution for spraying dense prickly-pear can be made. The arsenic poison destroys the corneal tissue of the pear and the plant dies, after which it can be burnt. It has also been discovered that by gassing dense prickly-pear with arsenious chloride gas the same result is achieved, and with less trouble. The most important industrial application of arsenic in Australia has been for the manufacture of cattle dips, for which purpose arsenite of soda is used. These dips are utilized to kill the cattle-tick, sheep-lice, and other vermin in the coats of animals, and also to moderate the mischief done by the sheep-maggot fly."

In melting glass, white arsenic thrown in the fused batch immediately sinks to the bottom and there vaporizes rapidly, causing a bubbling up of the bath with a purifying and an homogenizing effect. Very little arsenic remains in the glass. White arsenic is also used as a decolorizing agent for glass; it oxidizes the carbon and sulphur compounds which give a yellowish color to the glass. It also diminishes or destroys colorations due to metallic oxides, and has the property of giving brilliancy and augmenting the resistance of the glass.[2]

[1] "Arsenic and Its Occurrences in South Queensland." Dr. H. I. Jensen, *Queens. Govt. Min. Jour.*, Oct. 15, Nov. 15, 1918.

[2] *Chem. Ztg.*, **42**, 14 (1918), through *Chem. Abstr.*, **12**, 1342.